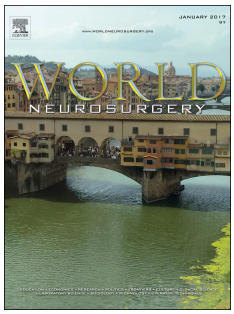

# Predictors of Patient Satisfaction in Spine Surgery: A Systematic Review

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**Abstract**

**Background:** Recently, there has been increased interest in patient satisfaction measures such as Press Ganey and Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) surveys. This systematic review aims to analyze the available spine surgery literature to evaluate factors predictive of patient satisfaction as measured by these surveys.

**Methods:** A thorough literature search was performed in PubMed/MEDLINE, Google Scholar, and Cochrane databases. All English-language articles from database inception to July 2020 were screened for study inclusion according to PRISMA guidelines.

**Results:** Twenty-four of the 1,899 published studies were included for qualitative analysis. There has been a statistically significant increase in the number of publications across years ($p$=0.04). Overall, the studies evaluated the relationship between patient satisfaction and patient demographics (71%), pre- and intra-operative clinical factors (21%), and post-operative factors (33%). Top positive predictors of patient satisfaction were patient and nursing/medical staff relationship (n=4; 17%), physician-patient relationship (n=4; 17%), managerial oversight of received care (n=3; 13%), same sex/ethnicity between patient and physician (n=2; 8%), and older age (n=2; 8%). Top negative predictors of patient satisfaction were high Charlson Comorbidity index/high disability/worse overall health functioning (n=7; 29%), increased length of hospital stay (n=4; 17%), high rating for pain/complications/readmissions (n=4; 17%), and psychosocial factors (n=3; 13%).

**Conclusions:** There is heterogeneity in terms of different factors, both clinical and non-clinically related, that affect patient satisfaction ratings. More research is warranted to investigate the role of hospital consumer surveys' ratings in the spine surgical patient population.

**Keywords:** satisfaction; spine surgery; neurosurgery; Press Ganey; HCAHPS; survey

## Introduction

In recent years, patient satisfaction measures have played an increasingly important role in the evaluation of hospital and surgeon performance, quality of care, and reimbursement.[1, 2] Although objective and functional outcomes have been widely studied in both neurosurgical and orthopedic spine operations,[3] there exists a relative void in systematic assessments of this population's subjective patient satisfaction measures. Patient satisfaction can be broadly categorized as contentment with the diagnosis process, delivery of care, and/or clinical outcomes.[4] A satisfactory clinical outcome, such as cessation of pain, may be achieved despite an unsatisfactory process of care (e.g., difficult insurance process, long clinic wait-time) or delivery of care (e.g., high cost, delay of treatment, unexpected post-operative setting or length of stay). Since many factors may influence a surgical patient's evaluation of care quality and "satisfaction", attempts to quantify this multifaceted and complex outcome measure via Likert and/or visual analog scales may be inadequate and arduous.

Nonetheless, patient satisfaction measures such as Press Ganey[5] and Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS)[6] surveys are widely used to query patients' perceptions of their hospital experience.[7] The Centers for Medicare and Medicaid Services even requires all U.S. hospitals to administer HCAHPS surveys to all inpatient individuals, the results of which may directly influence physician and hospital compensation and reimbursement.[7-10] Regardless of the widespread utilization of these surveys, there exists no systematic review evaluating predictors of spine surgery patient satisfaction based on the two most widely utilized surveys—Press Ganey and HCAHPS. As such, this systematic review aims to analyze the available literature of spine surgery Press Ganey and HCAHPS surveys especially highlighting predictive factors of patient satisfaction.

## Materials and Methods

*Database Search*

This study was exempt from Institutional Review Board evaluation due to its investigation of publicly accessible literature and non-involvement of human subjects. A thorough literature search of the published English-language literature was performed in the National Library of Medicine PubMed/MEDLINE, Google Scholar, and Cochrane databases using the keywords ("spine") AND ("press ganey" OR "HCAHPS") from database inception to July 2020 (**Figure 1)**. Each abstract was reviewed independently for relevance by three authors (BML, KG, and NJB) and another author (RS) acted as the final mediator if disagreements for inclusion occurred. Each article's reference list was screened to identify additional articles that met our inclusion criteria for this study. Full manuscripts of the studies that met inclusion criteria were evaluated independently by two authors (BML and RS). This study was conducted in agreement with the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines.[11]

*Inclusion and Exclusion Criteria*

Inclusion criteria consisted of 1) English language, 2) original research, and 3) utilizing Press Ganey or HCAHPS survey in spine surgery patients. Case reports, editorials/commentaries, reviews, and preliminary data in the form of abstracts were excluded. Furthermore, studies that did not indicate a particular satisfaction survey utilized or those that utilized a different measure other than Press Ganey or HCAHPS surveys were excluded.

*Data collection*

The primary outcome variables were positive, negative, and neutral predictors of patient satisfaction. Secondary outcome variables consisted of the type of survey utilized, patient

satisfaction definition, sample size, clinical population, study type, publication year, journal published, and the 2018 journal impact factor (via Web of Science Group *Journal Citations Report*, Clarivate Analytics, 2018). Also, study quality of the analyzed manuscripts was assessed in relation to the level of evidence (I-IV).[12]

*Statistical Analysis*

Quantitative data was analyzed using descriptive statistics in the form of percentages. Top-box scores were defined as the sum of the highest points on a satisfaction scale, with a high top-box score reflecting a higher proportion of favorable ratings and a low top-box score reflecting a lower proportion of favorable ratings. Linear regression was used to determine trends in publications across years. All statistical analyses were performed in PASW Statistics 18.0 software (SPSS Inc., Chicago, IL). A $p$-value of $< 0.05$ was statistically significant.

## Results

A total of 26 articles in PubMed, 1840 articles in Google Scholar, 25 articles in Cochrane, and 8 articles by examining the references of each included paper were identified. After these 1,899 articles were screened for inclusion (**Figure 1)**, 24 studies met inclusion criteria for qualitative analysis. Summary tables of all the studies included in our analysis are presented in **Table 1 and Table 2**. Many of the studies were published in journals pertaining to spinal disorders (**Table 3**). Temporal trends in the number of publications published per year demonstrated a significant increase in the number of publications year after year ($p$=0.04). Most included studies retrospectively reviewed patient records and reported demographic and/or pre-operative clinical variables along with post-operative clinical variables influencing Press Ganey or HCAPHS survey measures. For most studies, patient satisfaction with hospital experience was

defined as scores of 9-10 on HCAPHS surveys and 8-11 on Press Ganey surveys. HCAHPS surveys were utilized in most studies (n=15; 62.5%) by using the top-box/perfect score metric to measure patient satisfaction (n=12; 80%) (**Table 4**). Press Ganey survey was evaluated by less studies (n=9; 37.5%) where satisfaction was most commonly measured using continuous scale metrics (n=4; 44.4%) (**Table 4**).

The included studies evaluated the relationship between patient satisfaction and variables that could be broadly categorized as follows (not mutually exclusive): a) patient demographics (n=17; 71%), b) pre- and intra-operative clinical variables (n=5; 21%), and c) post-operative factors depending on the temporal timeline of survey administration (n=8; 33.3%). Top positive predictors of patient satisfaction were patient and nursing/medical staff relationship (n=4; 17%), physician-patient relationship (n=4; 17%), managerial oversite of received care (n=3; 13%), same sex/ethnicity between patient and physician (n=2; 8%), and older age (n=2; 8%) **(Table 5)**. Top negative predictors of patient satisfaction were high Charlson Comorbidity index/high disability/worse overall health functioning (n=7; 29%), increased length of hospital stay (n=4; 17%), high rating for pain/complications/readmissions (n=4; 17%), and psychosocial factors (n=3; 13%) (**Table 5**).

## Discussion

To our knowledge, this is the first study to systematically review the available literature pertaining to spine surgery patient satisfaction as evaluated through the two most administered patient satisfaction surveys—Press Ganey and HCAHPS. Though two previous reviews have broadly reported on this topic,[13, 14] this manuscript presents a comprehensive review and analysis of the two most widely utilized patient satisfaction surveys in order to identify factors most

predictive of patient satisfaction following spine surgery. These relatively subjective measures used to quantify patient satisfaction are increasingly being utilized in hospital systems year over year.[15] Therefore, it is imperative to examine predictors of positive and negative patient satisfaction to adjust practice patterns where needed. Time and continuous research will tell whether these measures can be valuable in changing delivery of care or eventual patient clinical outcomes.

*Press Ganey*

The Press Ganey (Nashville, Tennessee) survey was developed in 1985 by Irwin Press, PhD and Rod Ganey, PhD, and is now nationally recognized as a premier patient satisfaction survey. Due to their meticulously designed patient-centered and broad care delivery questions, there are currently greater than 20,000 hospitals and health centers utilizing this platform to evaluate patient satisfaction.[16-18] The main criticisms with the Press Ganey survey are its large heterogeneity and ambiguity in terms of assessing and quantifying satisfaction.[7] Olivero and colleagues recently brought into question the usefulness of Press Ganey in spine surgery patients by evaluating the association between Press Ganey scores and lumbar spine quality outcome measures from the National Neurosurgery Quality and Outcomes Database (N2QOD).[19] The authors demonstrated a negative correlation between top-box Press Ganey scores and the N2QOD results. Specifically, surgeons with lower top-box Press Ganey scores had lower post-operative hospital stay lengths and complication rates.[19] This negative correlation observed in their study (correlation coefficient = -0.9), therefore, demonstrates that patient satisfaction measures cannot be used as a global variable to assess the relationship between clinical outcomes and high patient satisfaction. Moreover, a recent study demonstrated that patient

satisfaction with physician communication is not necessarily correlated with post-operative patient reported health-status measures and outcomes 1-year following spine surgery.[20]

Many studies in our review identified several key factors predictive of negative patient satisfaction that were consistent across multiple investigations, with spine patients typically reporting lower patient satisfaction than non-spine patients.[21] This trend may suggest that achieving the goal of high patient satisfaction may not be entirely reflective of achieving "optimal overall care/clinical outcomes". Instead, high patient satisfaction may be measuring an absence of patient-perceived dissatisfaction related to many potential factors (i.e., clinically and non-clinically related) as part of the care process, which is more than likely outside the control of any single provider. From our systematic review, increased post-surgical length of stay was among many factors most likely predictive of low patient satisfaction.[19, 22] However, shorter post-surgical lengths of stay did not necessarily correlate to high top-box Press Ganey scores.[22]

It is possible that having pre-existing medical conditions can impact patients' top-box Press Ganey scores. A recent study found that Charlson/Deyo Comorbidity Index was negatively associated with receiving a high top-box Press Ganey score.[22] Additionally, a study by Mazur and colleagues identified that patients with self-reported "severe" disability tended to register low top-box Press Ganey scores.[23] The potential association between comorbidities/disabilities and patient satisfaction has also been discussed in other spine surgery studies using a standard survey[24] or the Musculoskeletal Outcomes Data Evaluation and Management System's satisfaction survey.[25] Lastly, mental health such as psychological distress has been shown to negatively affect patient satisfaction. A study by Abtahi and colleagues demonstrated that "distressed-depressive" and "distressed-somatic" patients reported significantly lower overall and provider-specific satisfaction scores compared to "normal" patients, as defined by the

study's assessments.[26] Taken together, these studies suggest that the physical and overall mental health of patients undergoing spine surgery may influence their reported Press Ganey satisfaction scores, although one study did not find an association between overall health functioning and patient satisfaction.[27] As such, this can be considered when clinicians and staff are providing various services and/or communicating post-operative care to patients that are less mentally or physically capable. Also, other variables that were notably found to be associated with lower Press Ganey patient satisfaction scores were higher education level, paper/pen survey administration, having commercial/private insurance, and patients advised against a surgical operation.[23, 28]

Moreover, there may exist several clinical and/or demographic factors associated with receiving high patient satisfaction scores that are uncontrollable by the physicians' clinical expertise and/or provided care, such as patients' older age and patients being the same sex/race as the provider.[28, 29] On the other hand, we found that factors relating to the physician-patient relationship can potentially be associated with patient satisfaction, such as quality of physician counseling and prompt meetings based on their scheduled appointments.[30] Overall, these studies suggest that patient satisfaction is multifaceted and many aspects either directly controllable or uncontrollable by the clinician and/or medical staff can impact patients' perceived satisfaction or dissatisfaction.

*HCAHPS*

HCAHPS, produced by the Centers for Medicare & Medicaid Services and the Agency for Healthcare Research and Quality, was approved in 2005 for methodical appraisals of patient satisfaction. The survey is highly connected to hospital reimbursements through the Inpatient

Prospective Payment System and the Value-Based Purchasing program.[31] The HCAHPS survey, which can be distributed through multiple venues (e.g., mail, telephone) and varying languages, quantifies satisfaction matching the following criteria: 1) "communication with doctors", 2) "communication with nurses". 3) "responsiveness of hospital staff", 4) "pain management", 5) "communication about medicines", 6) "discharge information", 7) "care transition", 8) "cleanliness of hospital environment", 9) "quietness of hospital environment", 10) "recommend the hospital", and 11) "overall hospital rating" [32]. Survey responses depend on the specific question and comprise of either: 1) "never, sometimes, usually, and always", 2) "definitely no, probably no, probably yes, and definitely yes", and 3) "strongly disagree, disagree, agree, or strongly agree", and 4) ordinal scale of 1-10 for hospital rating. Top-box rating is most designated as the highest remark within each category: "always", "definitely yes", "strongly agree", or top-box score of 9-10.

From our systematic review of the spine surgery literature, several factors predictive of both patient satisfaction and dissatisfaction measured through the HCAHPS survey were identified. The association between HCAHPS-measured satisfaction and patient demographic and preoperative factors were investigated in three studies pertaining to spine surgical patients.[33-36] It was observed that allergies or depression in patients negatively impacted their reported satisfaction.[33, 34] Specifically, Levin and colleagues observed that pre-operative allergies were negatively associated with communication between patients and the nursing staff, pain management, communication about post-operative medicine use and medical care.[34] Two separate studies by Levin and colleagues observed that preoperative depression was negatively associated with satisfaction pertaining to doctor/nursing communication with patients, hospital staff alertness, discharge communication, overall rating of a hospital,[33] and doctor

respect/listening[37] in the lumbar and cervical spine surgical patient populations, respectively. Additionally, following a prospective study of 200 spine clinic patients, Bible and colleagues found that less formal education, younger age, and smoking were associated with lower patient satisfaction.[35] These studies further illustrate how factors objectively distinct from the physician's surgical expertise and clinical outcomes may affect the patient's perceived satisfaction following spine surgical operations.

Moreover, other spine surgical studies have attempted to uncover independent predictors for patient satisfaction assessed through HCAHPS. In a retrospective study on 1480 spine surgery patients, Mets and colleagues observed that top-box ratings were associated with older age, male gender, and undergoing cervical (compared to lumbar) spine surgery, while non top-box ratings were associated with worse overall health, undergoing non-elective procedures, increased post-operative length of stay, and experiencing any complication or requiring hospital readmission.[38] In another study of 391 lumbar spine surgery patients, longer post-operative length of stay was associated with lower top-box satisfaction for doctor listening and pain management subdivisions of the HCAHPS survey.[39] The role of post-operative readmissions was also assessed in a separate study of 453 lumbar spine surgery patients, where increased volume of post-discharge emergency department visits was associated with lower top-box overall scores for doctor respect/listening and discharge information subdivisions of the HCAHPS survey.[40] Additionally, Hopkins and colleagues' study of 1118 spine patients also noted lower top-box HCAHPS scores for patients with increased post-operative length of stay, lower overall health status, and patients undergoing revision surgeries, while no positive predictors of patient satisfaction were observed, suggesting that patient satisfaction may not be accurately assessed via the current measures.[41] This is not an unassuming conclusion since more than half (53%) of

our HCAHPS studies did not identify positive predictors of patient satisfaction.[33, 34, 37, 39-43] Lastly, it has been previously reported that in cases of low response rates, HCAHPS responders may not be representative of the total patient sample studied contributing to so-called nonresponder bias.[44]

In addition to studies by Levin et al. and Smith et al., patient perceived satisfaction regarding pain management was also assessed in Maher and colleagues study of 562 spine surgery patients, demonstrating an association between increased total intraoperative opioid dosage and a lower top-box overall satisfaction and hospital recommendation to family and friends.[43] They observed a lower top-box satisfaction for pain management for patients with increased surgery length, post-operative length of stay, and total intraoperative Ketorolac dosage. Additionally, Kerezoudis and colleagues observed that spine surgical patients reported lower top-box scores for pain management.[45] Hence, in addition to the surgical operation length and post-operative length of stay, patients' expectations or understanding thereof regarding pain management is important to consider as it may affect perceived patient satisfaction.

Moreover, some of the HCAHPS studies shed light on the potential influence of hospital staff engagement with patients during and following the surgical operation. For example, Levin and colleagues' study of 453 lumbar spine surgery patients observed that receipt of a top-box overall score was more often observed for patients with high satisfaction in the following HCAHPS subdivisions: a) doctor medication description, b) doctors and/or nursing staff respectfulness, c) doctor and/or nursing staff perceived listening proficiencies, d) description of medication side effects, e) regard for personal and family inclinations, f) facility cleanliness/hygiene and quietness, g) patient comprehension of post-operative care, and h) pain management.[46] A separate study by Bible and colleagues showed that perceived provider

compassion, along with swift appointment arranging, staff teamwork, nurse/resident engagement, wait times, and post-operative medical communications were highly associated with positive satisfaction results.[47] In attempts to understand factors that could improve the nursing/medical staff scores, Wang et al.'s study of 741 spine surgery patients reported that nurse/medical staff explanation scores were enhanced for patients who received goal setting and smart-room technology educational videos in comparison to those solely receiving their discharge time/date via written communication.[48] These studies suggest that aspects pertinent to interactions and communications between patients and their providers may largely affect global hospital ratings in the spine surgery patient population as measured through HCAHPS.

*Limitations*

Although we took great care in the collection and analysis of this data, there are several distinct limitations with our current study. First, our current conclusions regarding potential predictors of patient satisfaction is limited to our low sample size, and there exists large heterogeneity in our analyses of the included studies. Second, given the nature of the data reporting, we were unable to make reasonable comparisons between the HCAHPS and Press Ganey survey measures. Therefore, our analysis was segregated into separate descriptive and pooled analyses. Regardless, this manuscript reviewing all studies that evaluated patient satisfaction in spine surgery using HCAHPS and Press Ganey surveys adds an additional layer to the already multifaceted nature of understanding patient-perceived satisfaction in the spine surgery population. Continuous research in this field will help elucidate whether implementing HCAHPS and/or Press Ganey measures affect delivery of care and clinical outcomes.

## Conclusion

There is much variability in the literature in terms of different factors that affect patient satisfaction. We found that positive predictors of patient satisfaction tended to be related to the relationships between patients and their providers/associated medical staff members, while negative predictors of patient satisfaction tended to be either demographic factors not controllable by the provider and/or post-operative care management. More research is warranted to investigate the role of hospital consumer surveys' ratings in the spine surgical patient population.

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**Figure Legends**

**Figure 1.** PRISMA study selection flow diagram.

| Table 1: Included Study Characteristics | | | | | | |
|---|---|---|---|---|---|---|
| **Citation** | **Journal Name** | **Study Type (Retrospective vs Prospective)** | **Sample Size** | **Clinical Patient Population** | **Assessment (Press Ganey vs HCAPHS)** | **Definition of Patient Satisfaction** |
| Steinmetz et al., 2019 | Current Orthopaedic Practice | Retrospective | 1,400 | Ambulatory Spine Surgery Patients | Press Ganey | Overall Provider Rating (0-10) and Likelihood to Recommend |
| Levin et al., 2019 | Spine | Retrospective | 145 | Cervical Spine Surgery | HCAHPS | Top box (9-10) |
| Hopkins et al., 2019 | Journal of Neurosurgery: Spine | Retrospective | 1936 | Neurosurgical or Orthopedic Spine Patients | Press Ganey | Perfect score (5/5) |
| Hopkins et al., 2019 | Journal of Neurosurgery: Spine | Retrospective | 1118 | Neurosurgical or Orthopedic Spine Patients | HCAPHS | Perfect score (4/4) |
| Smith et al., 2019 | Journal of Neurosurgery: Spine | Retrospective | 391 | Lumbar Spine Surgery Patients | HCAPHS | Top box (9-10) |
| Mets et al., 2019 | Clinical Orthopaedics and Related Research | Retrospective | 1480 | Neurosurgical or Orthopedic Spine Patients | HCAPHS | Top box (9-10) |
| Galivanche et al., 2019 | Spine | Retrospective | 69 | Elective Spine Surgery Patients | HCAPHS | Top box (9-10) |
| Johnson et al., 2019 | Orthopedics | Retrospective | 1400 | Ambulatory Spine Surgery Patients | Press Ganey | Not specified |
| Chen et al., 2019 | Clinical Spine Surgery | Retrospective | 578 | Neurosurgical Spine Patients | Press Ganey | Continuous (0-100) |
| Olivero et al., 2018 | Neurosurgery | Retrospective | 77 | Lumbar Spine Surgery Patients | Press Ganey | Top box (5 or 9-10) |
| Levin et | Clinical Spine | Retrospective | 421 | Lumbar Spine | HCAPHS | Top box |

| | | | | | | |
|---|---|---|---|---|---|---|
| al., 2018 | Surgery | | | Surgery Patients | | (9-10) |
| Levin et al., 2018 | Journal of Neurosurgery: Spine | Retrospective | 453 | Lumbar Spine Surgery Patients | HCAPHS | Top box (9-10) |
| Levin et al., 2018 | The Spine Journal | Retrospective | 453 | Lumbar Spine Surgery Patients | HCAPHS | Top box (9-10) |
| Kerezoudis et al., 2018 | Journal of Neurosurgery | Retrospective | 1484 | Elective Spine Surgery Patients | HCAPHS | Top box (9-10) |
| Bible et al., 2018 | Spine | Prospective | 158 | Unspecified Spine Surgery Patients | Modified HCAPHS | Ordinal (1-10) |
| Levin et al., 2017 | The Spine Journal | Retrospective | 249 | Lumbar Spine Surgery Patients | HCAPHS | Top box (9-10) |
| Levin et al., 2017 | Spine | Retrospective | 237 | Lumbar Spine Fusion Surgery Patients | HCAPHS | Top box (9-10) |
| Abtahi et al., 2017 | Clinical Spine Surgery | Retrospective | 231 | Unspecified Spine Surgery Patients | Press Ganey | Continuous (0-100) |
| Etier et al., 2016 | The Spine Journal | Retrospective | 353 | Orthopedic Spine Surgery Patients | Press Ganey | Score of 8-11 (satisfied) |
| Mazur et al., 2015 | Journal of Neurosurgery: Spine | Retrospective | 130 | Neurosurgical Spine Disorders Patient Population | Press Ganey | Continuous (0-100) |
| Bible et al., 2015 | Spine | Prospective | 200 | Unspecified Spinal Disorders Patient Population | Modified HCAPHS | Ordinal (1-10) |
| Maher et | Pain Medicine | Retrospective | 562 | Unspecified | HCAPHS | Top box |

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| al., 2015 | | | | Spine Surgery Patients | | (9-10) |
| Abtahi et al., 2015 | The Journal of Bone and Joint Surgery | Retrospective | 103 | Unspecified Spine Surgery Patients | Press Ganey | Continuous (0-100) |
| Wang et al., 2013 | Computers, Informatics, Nursing | Retrospective | 741 | Orthopedic Spine Surgery Patients | HCAPHS | Continuous (0-100) |

| Table 2: Predictors of Patient Satisfaction | | | |
|---|---|---|---|
| **Citation** | **Predictors of High Patient Satisfaction or Negative Predictors of Low Patient Satisfaction** | **Predictors of Low Patient Satisfaction or Negative Predictors of High Patient Satisfaction** | **Comments** |
| Steinmetz et al., 2019 | Provider Communication, nursing/medical staff communication, and same ethnicity | Not identified | N/A |
| Levin et al., 2019 | None identified | Depressed patients reported lower satisfaction for doctor respect/listening (overall doctor communication) | Depressed patients were younger in age, more likely to have preoperative neck pain, and lower quality of life |
| Hopkins et al., 2019 | None identified | High Charlson Comorbidity Index, increased time since surgical operation/discharge, and increased post-operative hospital stay | The perceived expertise of the surgeon was not a prognosticator for top-box or low Press Ganey scores; Patients who had a posterior-approach surgical procedure in comparison to other procedures were less likely to note a low (</=2) Press Ganey score |
| Hopkins et al., 2019 | None Identified | Revision surgeries, urgent/emergency procedures, increased time since surgery/ discharge, increased post-operative hospital stay, and high Charlson Comorbidity Index | N/A |
| Smith et al., 2019 | None Identified | Patients with high post-operative hospital stay were half as likely to report their physician | N/A |

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|---|---|---|---|
| | | either a) listened to them, or b) treated them with courtesy and respect; longer post-operative hospital stay were associated with lower scores for c) pain management, d) explanations of pain medication administration, and e) overall hospital rating | |
| Mets et al., 2019 | Older age (>40 years), gender identification as male, and cervical surgery (compared to lumbar surgery) | American Society of Anesthesiologists (ASA) classification >/= 2, non-elective surgery, having any adverse event within 30 days, readmission within 30 days, and longer post-operative hospital stay | Patients' hospital ratings did not differ by surgeon's specialty (neurosurgery vs orthopedics). |
| Galivanche et al., 2019 | Not investigated | Not investigated | HCAPHS responses were not significantly correlated with admission narcotics scores. |
| Johnson et al., 2019 | Older age and same sex/ethnicity as provider | Higher education level (graduate level education), paper and pen/pencil survey administration, and commercial/private insurance | N/A |
| Chen et al., 2019 | Not investigated | Not investigated | In comparison to non-spine patients, spine patients noted overall lower satisfaction, physician/nurse care, personal concerns, |

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| | | | admission/visitor environments, and overall hospital rating. |
| Olivero et al., 2018 | Low National Neurosurgery Quality and Outcomes Database (N2QOD) scores were associated with high Press Ganey scores | High National Neurosurgery Quality and Outcomes Database (N2QOD) scores were associated with lower Press Ganey scores; high volume of post-operative complications and longer post-operative hospital stay were associated with low Press Ganey scores | N/A |
| Levin et al., 2018 | None identified | Higher quantity of patient-reported medical and environmental allergies | N/A |
| Levin et al., 2018 | Staff managing pain, respect/listening from nursing staff/physician, communication of medication side effects, cleanliness, post-operative health care was explained by nurses/physicians, quietness, attentiveness of staff, and perceived quality of care delivered | Lower overall health status | Previous lumbar spine surgery, history of chronic renal failure, Caucasian race, history of cancer, length of post-operative hospital stay, and mental health status were not associated with top-box HCAPHS scores |
| Levin et al., 2018 | None identified | Post-discharge emergency department visits | Prior lumbar surgery, history of coronary artery disease, in-hospital complications, length of post-operative hospital stay, and pre-operative EuroQol 5-Dimensions index score were not |

| | | | |
|---|---|---|---|
| | | | associated with top-box HCAPHS scores |
| Kerezoudis et al., 2018 | In comparison to degenerative spine disease patients, oncology, and other disease (e.g., intracranial aneurysm, normal pressure hydrocephalus, and movement disorders) patients recorded higher top-box scores; in comparison to cranial patients, spinal patients reported higher top-box scores in delivery of discharge information | In comparison to cranial patients, spine patients recorded lower top-box scores in pain management and communication/responsiveness of doctors/ staff | N/A |
| Bible et al., 2018 | Univariate: appointment scheduling, office staff friendliness, teamwork (nurse-practitioner/resident involvement), low wait times, provider interactions/behavior, treatment, and follow-up communication; multivariate: medical care communication, empathy, teamwork of staff, and follow-up communication | None identified | Pain medication prescribing and provider time spent with patients was not correlated with satisfaction; analysis was performed on both operative and non-operative spine cases |
| Levin et al., 2017 | None identified | None identified | Pre-operative to 1-year post-operative increases in optimal clinical outcome measures defined as EuroQol 5 Dimensions (EQ-5D), Pain Disability |

| | | | |
|---|---|---|---|
| | | | Questionnaire (PDQ), and Visual Analog Score for back pain (VAS-BP) were not significantly correlated with improved top-box scores |
| Levin et al., 2017 | None identified | Depressed patients were associated with recording lower top-box scores than non-depressed patients on multiple survey components: doctor/nursing communication, hospital recommendation, help received; tobacco use was associated with lower scores for physician respect | N/A |
| Abtahi et al., 2017 | None identified | None identified | No significant correlations between the Oswestry Disability Index (ODI), the Neck Disability Index (NDI), and the EuroQol (EQ)-5D measures and patient satisfaction in new, recurring, and post-operative spine patients |
| Etier et al., 2016 | Lower pain score, "definitely" response to "provider spent enough time with you" question on Press Ganey survey, and patients seen close to appointment scheduled time | Not investigated | N/A |
| Mazur et al., 2015 | Not investigated | Satisfaction was lower for | Analysis was not on post- |

| | | | |
|---|---|---|---|
| | | patients with severe disability and had received a recommendation against surgical operation | operative spine patients, but during consult visit for outpatient back pain work-up |
| Bible et al., 2015 | Patients with Medicare and non-work-related injuries/medical care | Younger age, male, less formal education, patients treated through worker's compensation claim, and smoking history | Marital status, working status, pain/mental health status, travel distance, quantity of prior treatments, cervical versus lumbar spine surgery, and narcotic use were not correlated with satisfaction |
| Maher et al., 2015 | None identified | Low hospital score noted for patients with increased opioid dosage, lower amount of help received post-operatively, increased intraoperative keterolac dosage, and higher pain scores, increased hospitalization time, and longer post-anesthesia care unit stay | N/A |
| Abtahi et al., 2015 | Not investigated | “distressed” spine patients gave lower global and provider satisfaction than their “normal” counterparts | Distress was measured by the Distress and Risk Assessment Method (DRAM) questionnaire |
| Wang et al., 2013 | Higher satisfaction in nurse/staff explanation of medications observed for patients with goal setting and smart room technology education videos contrasted with patients receiving | None identified | The surgical flight plan is a written information patient received regarding their date and time of post-operative hospital discharge |

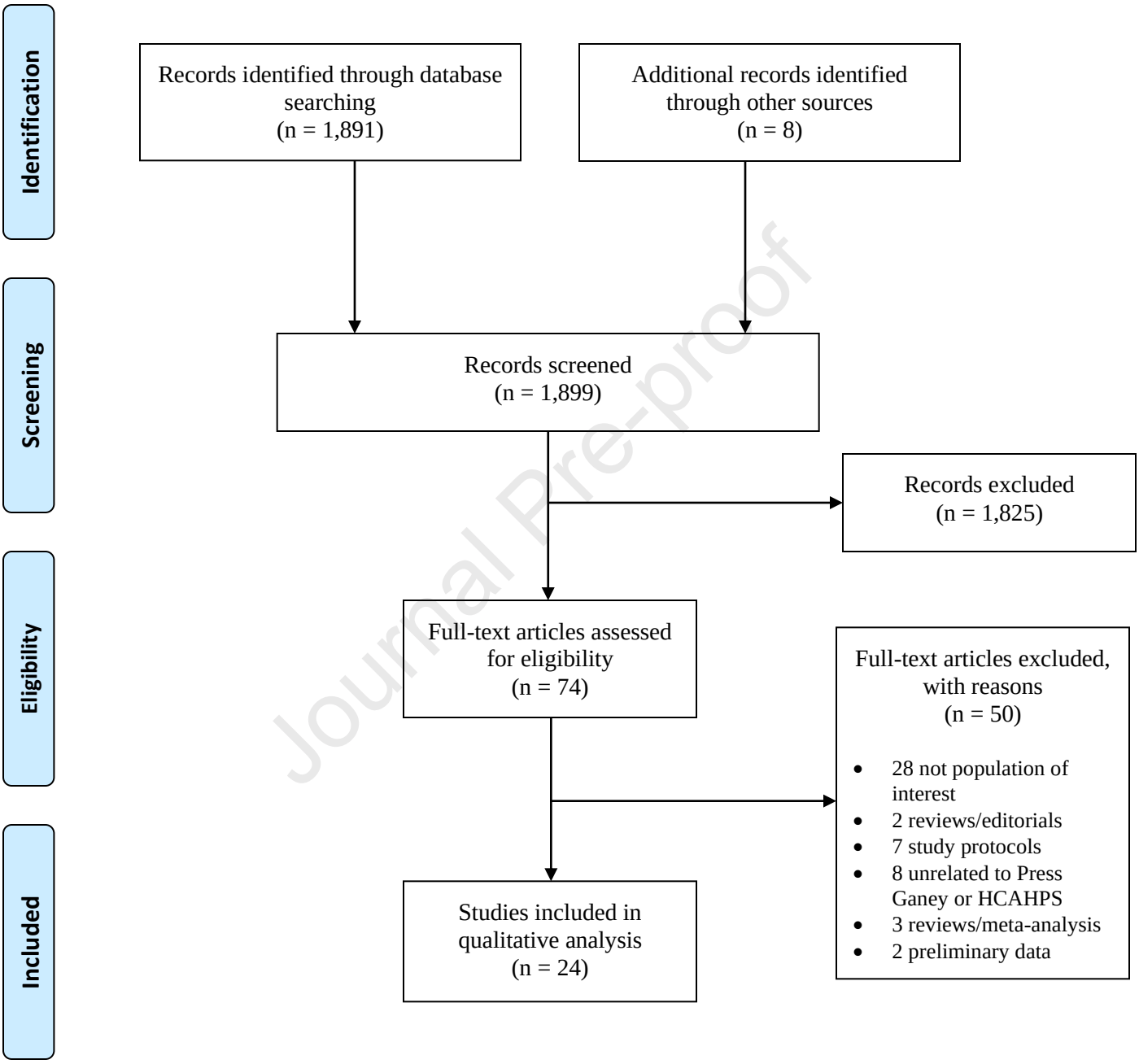
| | | | |
|---|---|---|---|
| | “surgical flight plan” | | |

| **Table 3: Journals Publishing Spine Satisfaction** | | |
|---|---|---|
| Journal Title | N = 24 | Impact Factor* |
| *Journal of Neurosurgery: Spine* | 5 | 3.0 |
| *Spine* | 5 | 2.9 |
| *The Spine Journal* | 3 | 3.2 |
| *Clinical Spine Surgery* | 3 | 1.7 |
| *The Journal of Bone and Joint Surgery* | 1 | 4.7 |
| *Neurosurgery* | 1 | 4.6 |
| *Clinical Orthopedics and Related Research* | 1 | 4.2 |
| *The Journal of Neurosurgery* | 1 | 4.1 |
| *Pain Medicine* | 1 | 2.8 |
| *Orthopedics* | 1 | 1.6 |
| *Computers, Informatics, Nursing* | 1 | 1.0 |
| *Current Orthopaedic Practice* | 1 | NA |
| | | |
| *2019 Journal Citation Reports | | |

| **Table 4: Surveys used to assess patient satisfaction.** | |
|---|---|
| *HCAHPS (N=15; 62.5%)* | Number of studies (%*) |
| Perfect Score/Top-box<br>Ordinal<br>Continuous | *12 (80.0)*<br>*2 (13.3)*<br>*1 (6.7)* |
| *Press Ganey (N=9; 37.5%)* | Number of studies (%*) |
| Continuous<br>Perfect Score/Top-box<br>Unspecified/Other | *4 (44.4)*<br>*3 (33.3)*<br>*2 (22.2)* |
| *Add up to 100% within HCAHPS or Press Ganey cohorts. | |

| **Table 5: Top Positive and Negative Predictors of Patient Satisfaction** | | |
|---|---|---|
| *Top Positive Predictors* | N | % |
| Nursing/medical staff-patient relationship | 4 | 17 |
| Managerial oversite of care | 3 | 13 |
| Physician-patient relationship | 3 | 13 |
| Same sex/ethnicity between patient and physician | 2 | 8 |
| Older age | 2 | 8 |
| | | |
| *Top Negative Predictors* | N | % |
| High Charlson Comorbidity/Disability/Overall Health | 7 | 29 |
| Increased Length of Stay | 4 | 17 |
| Pain Management/Complications/Readmissions | 4 | 17 |
| Psychosocial factors | 3 | 13 |

# PRISMA Flow Diagram






*From:* Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). *P*referred *R*eporting *I*tems for *S*ystematic Reviews and *M*eta-*A*nalyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

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